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Ahmad

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[54] **METHOD AND SYSTEM FOR TROUBLE SHOOTING AND CORRECTING COMPUTER SOFTWARE PROBLEMS**

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[51] **Int. Cl.**[7] **G06F 15/40**

[52] **U.S. Cl.** **714/46**; 714/47; 714/48; 714/26

[58] **Field of Search** 714/25, 26, 31, 714/38, 46, 48, 47

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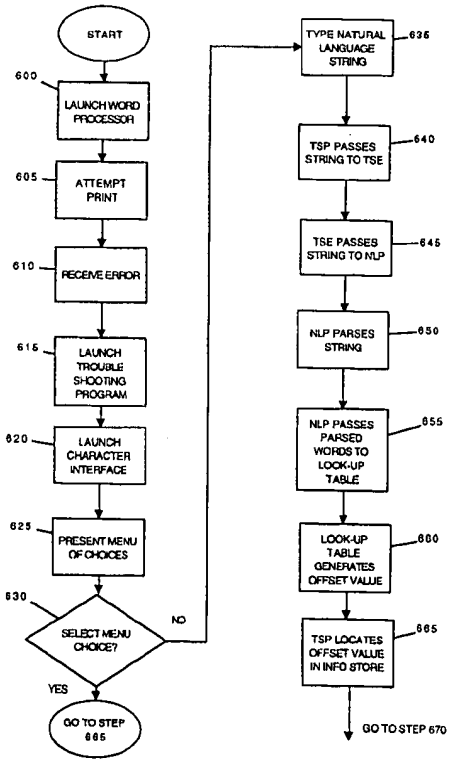
Primary Examiner—Norman Michael Wright

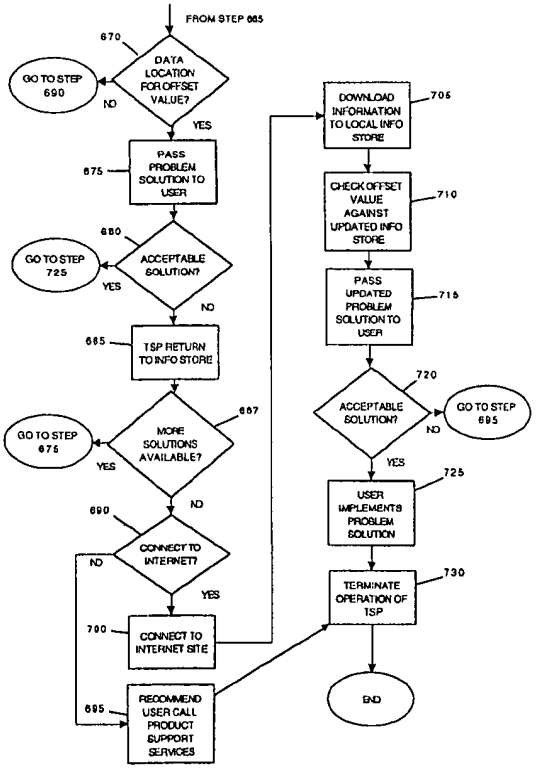
Attorney, Agent, or Firm—Jones & Askew, LLP

[57] **ABSTRACT**

A method and system for trouble shooting and correcting computer software problems. A Trouble Shooting System is launched onto a computer when a user of a software application encounters a problem during use of that software application. The Trouble Shooting System includes a Character Interface, a Trouble Shooting Program, and an Internet-based Trouble Shooting site and server. The Character Interface allows the user to select from a menu of problems, or the user may type into the Character Interface a natural language string to identify the problem. The Trouble Shooting Program generates offset values corresponding to the problem identified by the user. The Trouble Shooting program uses the offset values to locate problem solutions in an Information Store of problem solutions. The problem solutions located in the Information Store are passed to the user for implementation of a correction of the problem. If no solution is found in the Information Store, the Trouble Shooting Program may connect the user's computer to the remote Internet-based Trouble Shooting site and server to obtain and download additional problem solutions and tools to the Information Store on the user's computer. If a solution to the problem continues to evade the user, the Trouble Shooting Program then may recommend that the user contact the product support services of the provider of the user's malfunctioning software application.

13 Claims, 7 Drawing Sheets





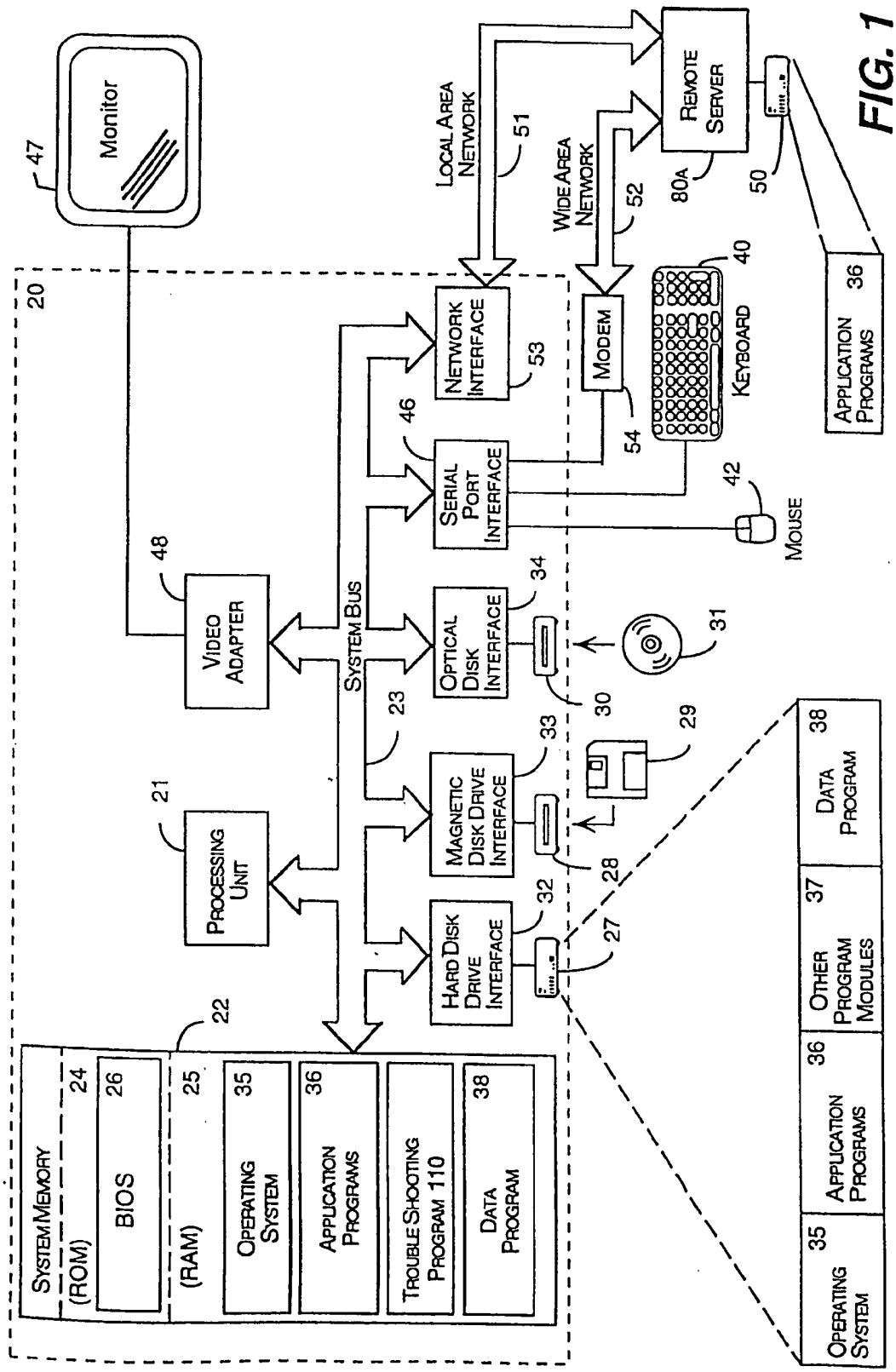

Monitor
47
20
Local Area Network
51
Wide Area Network
52
Remote Server
80A
50
Application Programs
36
Keyboard
40
Modem
54
Network Interface
53
Serial Port Interface
46
Mouse
42
Video Adapter
48
System Bus
Optical Disk Interface
34
31
30
23
Magnetic Disk Drive Interface
33
29
28
Processing Unit
21
Hard Disk Drive Interface
32
27
22
System Memory
24
(ROM)
BIOS
26
(RAM)
25
Operating System
35
Application Programs
36
Trouble Shooting Program 110
Data Program
38
Other Program Modules
37
Data Program
38
Application Programs
36
Operating System
35

FIG. 1

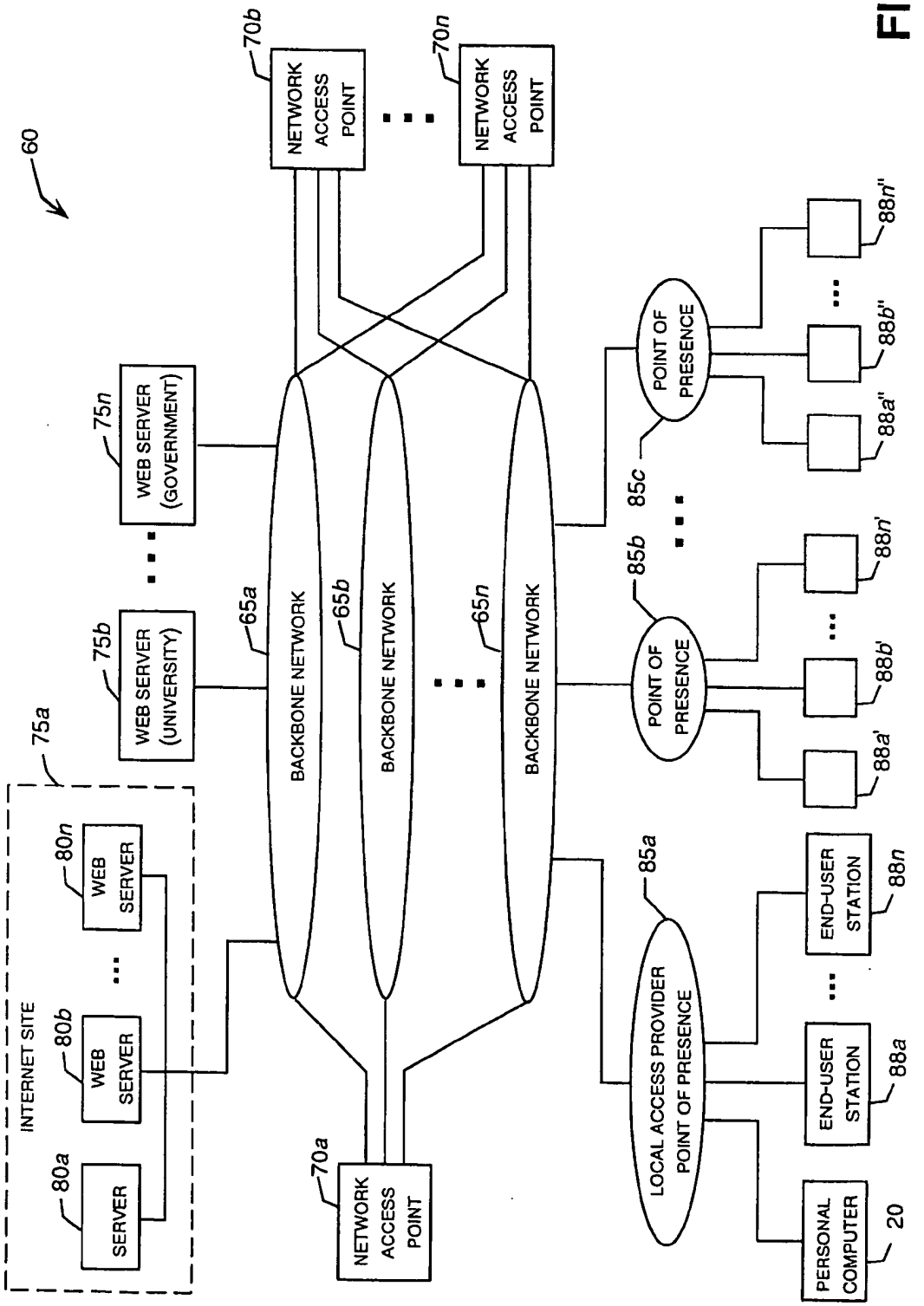

60
70b
NETWORK ACCESS POINT
70n
NETWORK ACCESS POINT
75n
WEB SERVER (GOVERNMENT)
75b
WEB SERVER (UNIVERSITY)
75a
INTERNET SITE
80n
WEB SERVER
80b
WEB SERVER
80a
SERVER
65a
BACKBONE NETWORK
65b
BACKBONE NETWORK
65n
BACKBONE NETWORK
70a
NETWORK ACCESS POINT
85c
POINT OF PRESENCE
85b
POINT OF PRESENCE
85a
LOCAL ACCESS PROVIDER POINT OF PRESENCE
88n''
88b''
88a''
88n'
88b'
88a'
88n
END-USER STATION
88a
END-USER STATION
20
PERSONAL COMPUTER

FIG. 2

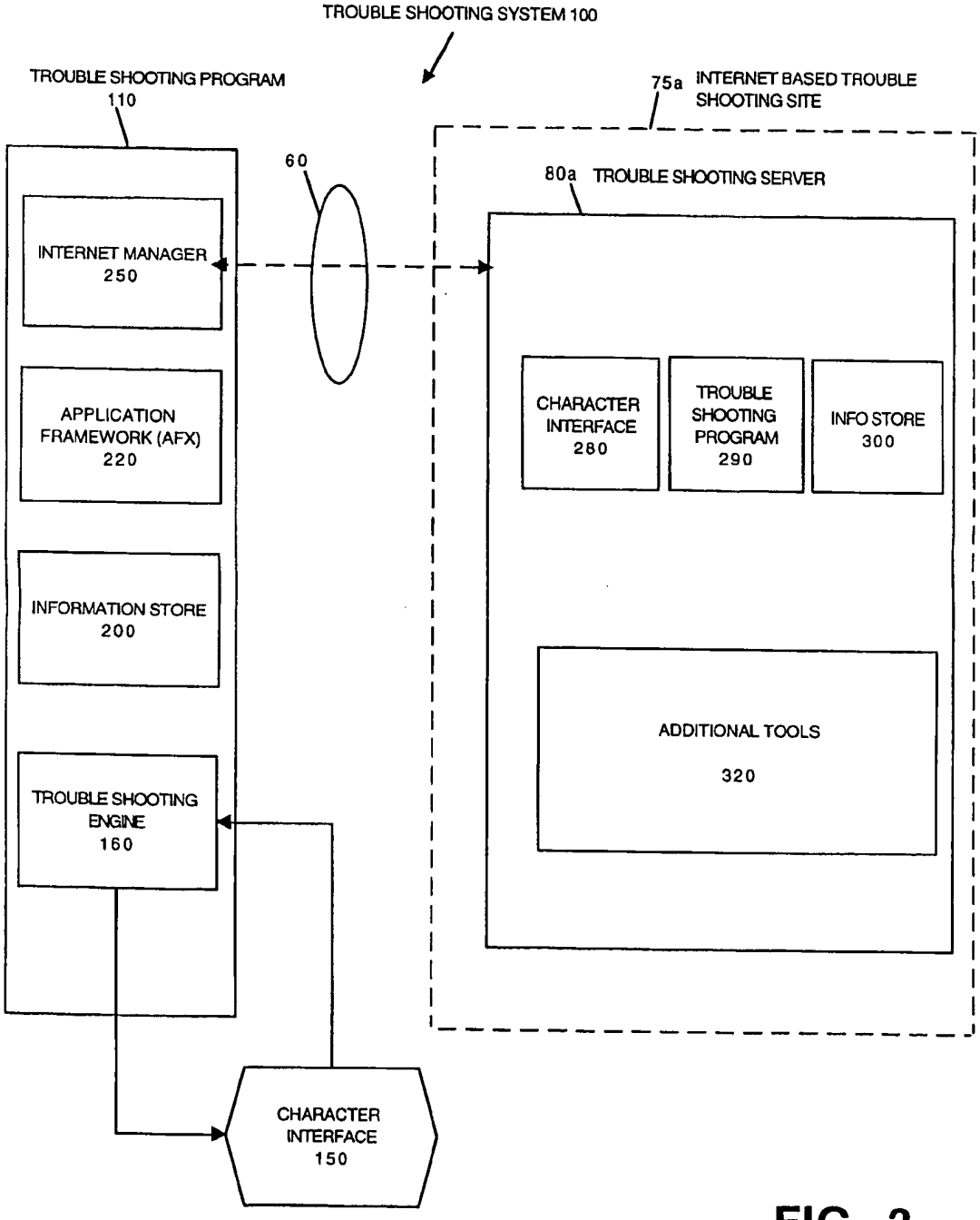

TROUBLE SHOOTING SYSTEM 100
TROUBLE SHOOTING PROGRAM
110
75a INTERNET BASED TROUBLE SHOOTING SITE
60
80a TROUBLE SHOOTING SERVER
INTERNET MANAGER
250
APPLICATION FRAMEWORK (AFX)
220
INFORMATION STORE
200
TROUBLE SHOOTING ENGINE
160
CHARACTER INTERFACE
280
TROUBLE SHOOTING PROGRAM
290
INFO STORE
300
ADDITIONAL TOOLS
320
CHARACTER INTERFACE
150

FIG. 3

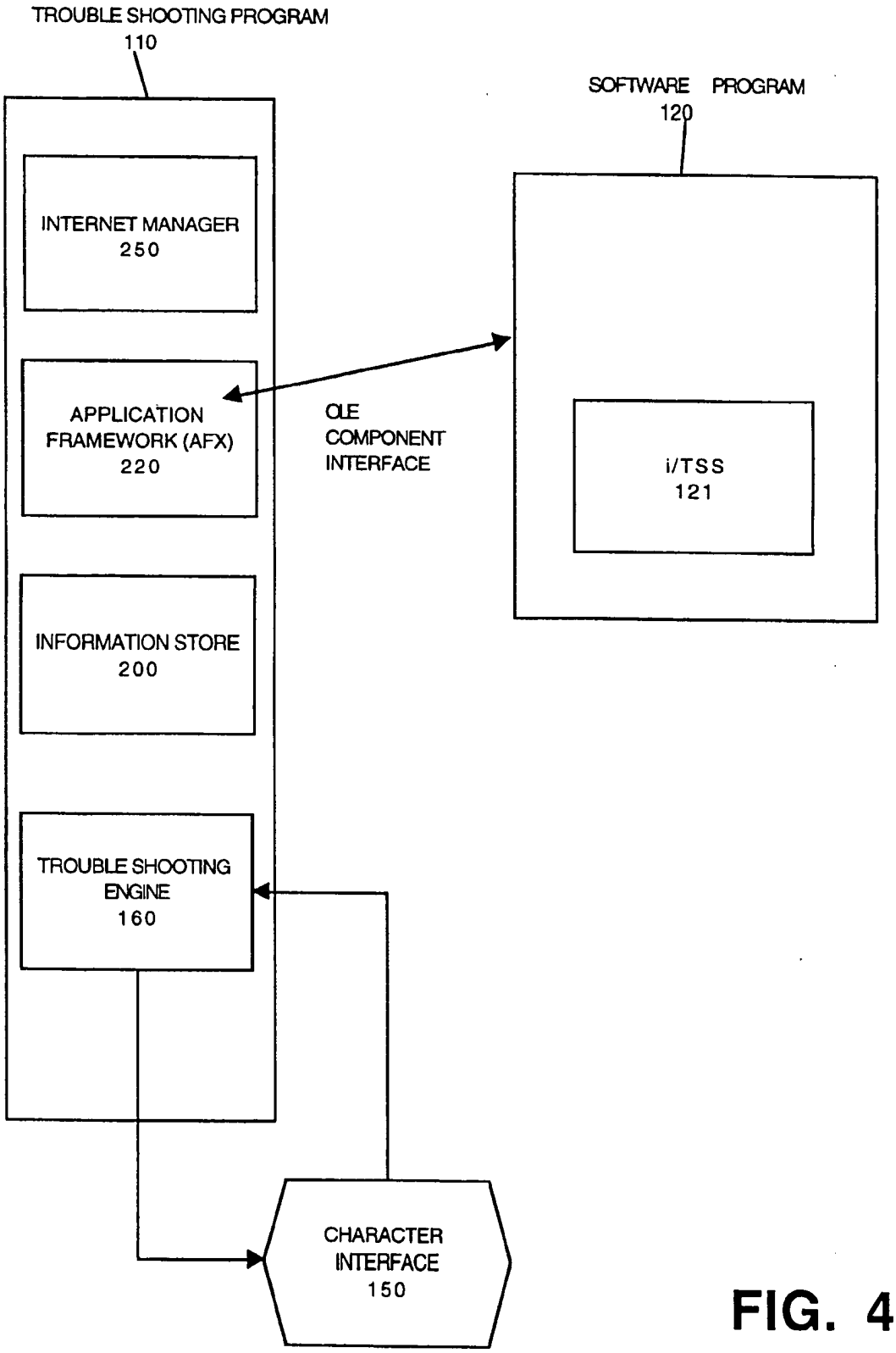

TROUBLE SHOOTING PROGRAM
110
SOFTWARE PROGRAM
120
INTERNET MANAGER
250
APPLICATION
FRAMEWORK (AFX)
220
OLE
COMPONENT
INTERFACE
i/TSS
121
INFORMATION STORE
200
TROUBLE SHOOTING
ENGINE
160
CHARACTER
INTERFACE
150

FIG. 4

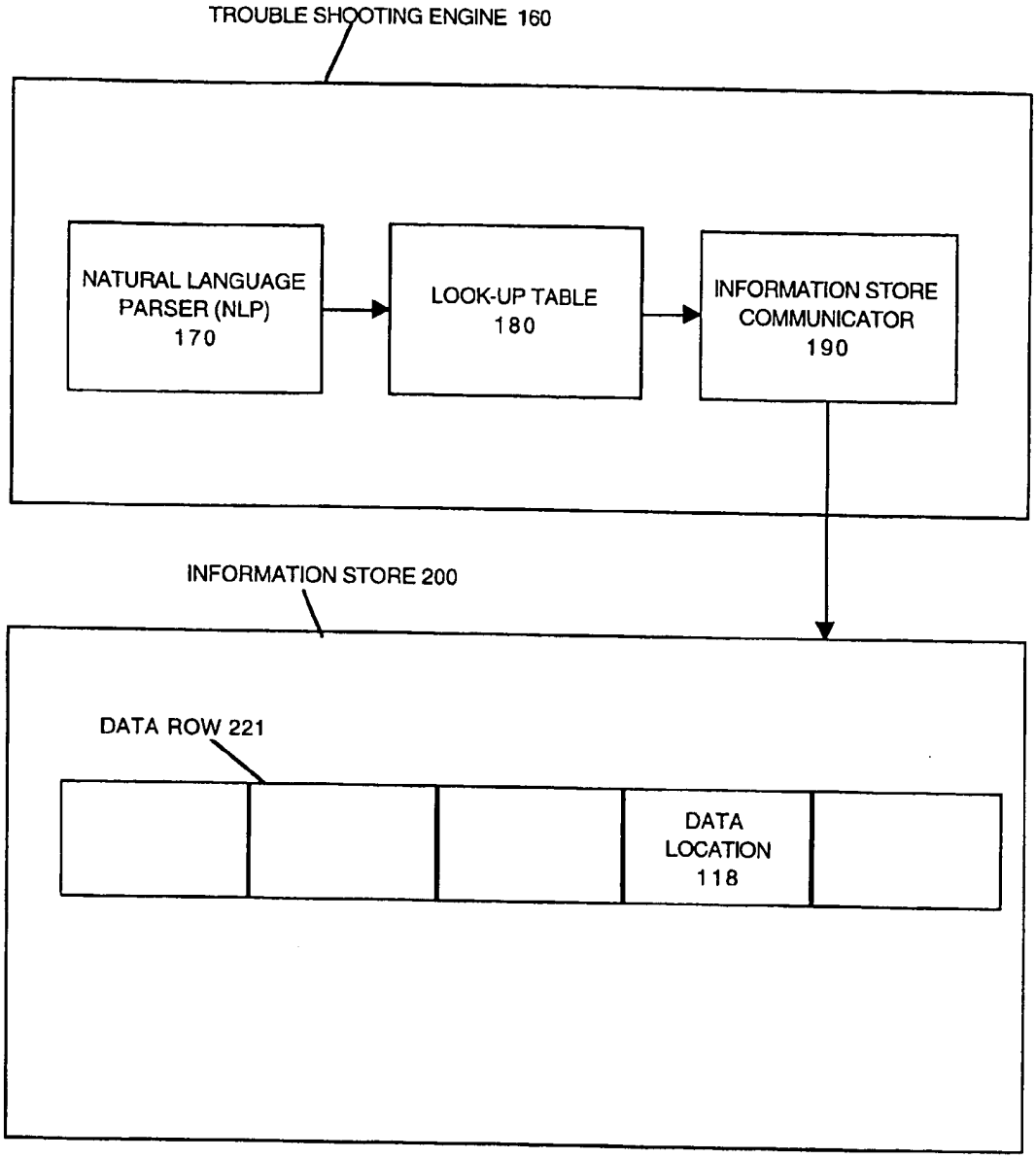

TROUBLE SHOOTING ENGINE 160
NATURAL LANGUAGE PARSER (NLP) 170
LOOK-UP TABLE 180
INFORMATION STORE COMMUNICATOR 190
INFORMATION STORE 200
DATA ROW 221
DATA LOCATION 118

FIG. 5

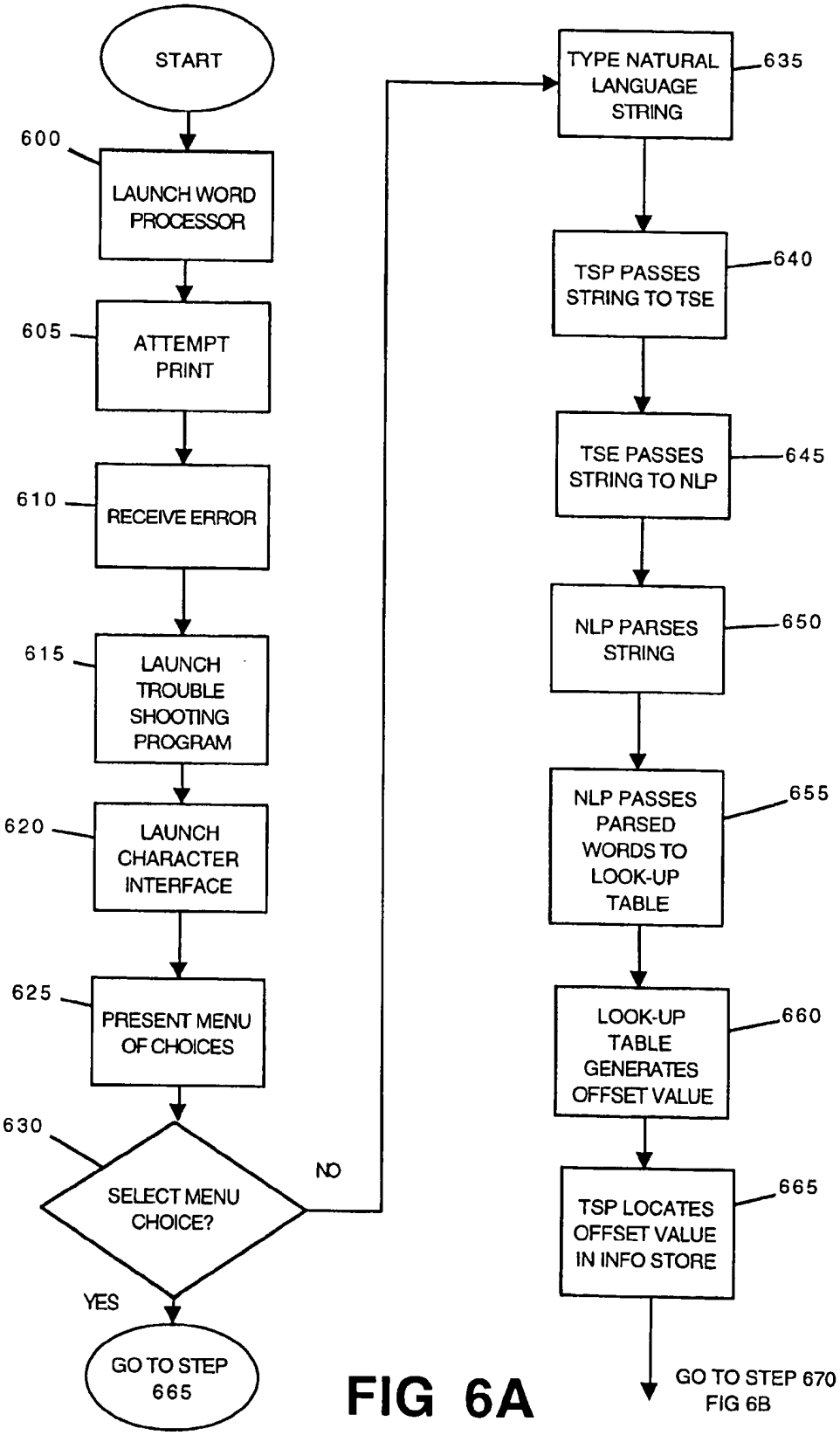

START
600
LAUNCH WORD PROCESSOR
605
ATTEMPT PRINT
610
RECEIVE ERROR
615
LAUNCH TROUBLE SHOOTING PROGRAM
620
LAUNCH CHARACTER INTERFACE
625
PRESENT MENU OF CHOICES
630
SELECT MENU CHOICE?
NO
YES
GO TO STEP 665
TYPE NATURAL LANGUAGE STRING
635
TSP PASSES STRING TO TSE
640
TSE PASSES STRING TO NLP
645
NLP PARSES STRING
650
NLP PASSES PARSED WORDS TO LOOK-UP TABLE
655
LOOK-UP TABLE GENERATES OFFSET VALUE
660
TSP LOCATES OFFSET VALUE IN INFO STORE
665
GO TO STEP 670 FIG 6B

FIG 6A

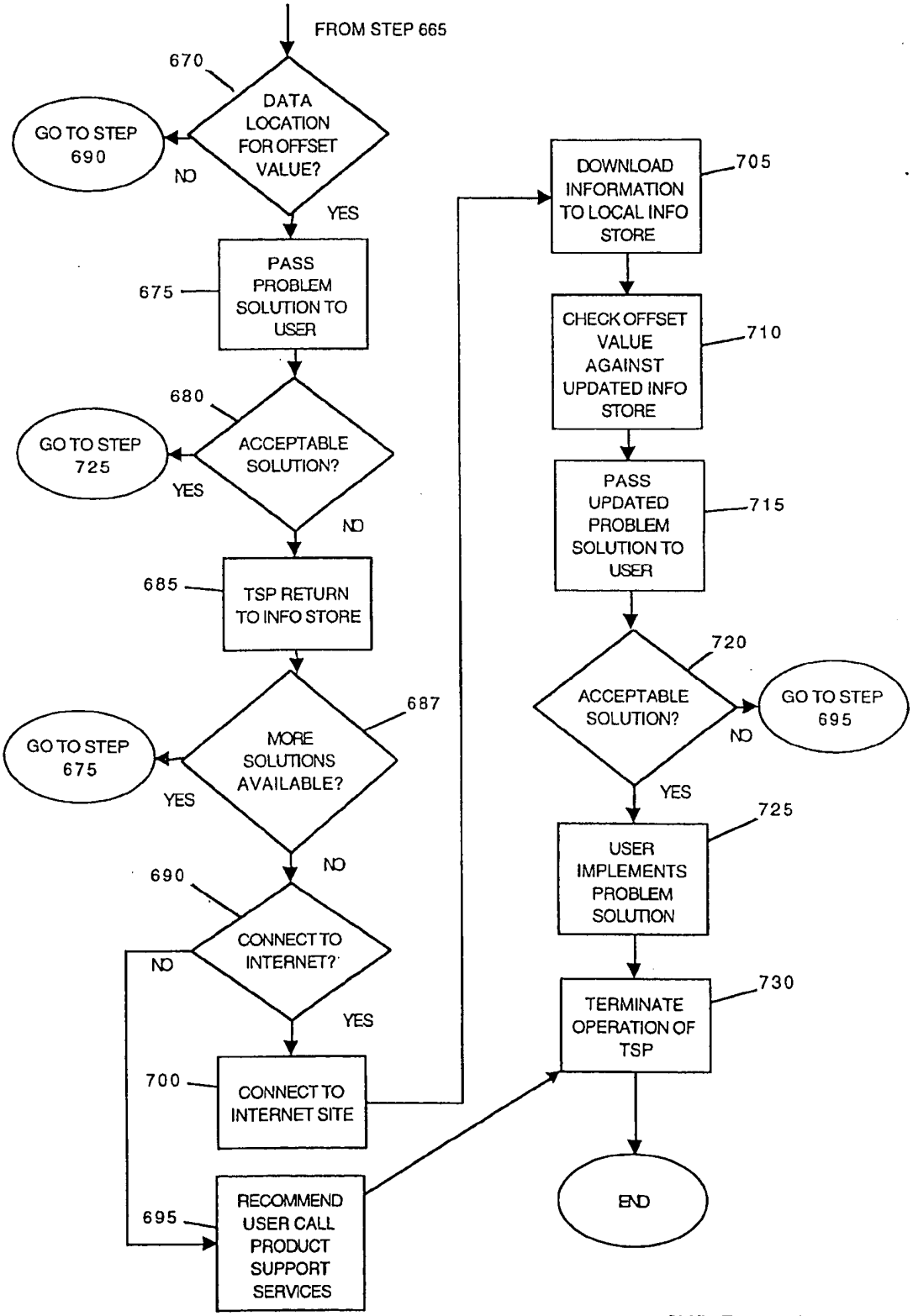

FROM STEP 665
670
DATA LOCATION FOR OFFSET VALUE?
GO TO STEP 690
NO
YES
675
PASS PROBLEM SOLUTION TO USER
680
ACCEPTABLE SOLUTION?
GO TO STEP 725
YES
NO
685
TSP RETURN TO INFO STORE
687
MORE SOLUTIONS AVAILABLE?
GO TO STEP 675
YES
NO
690
CONNECT TO INTERNET?
NO
YES
700
CONNECT TO INTERNET SITE
695
RECOMMEND USER CALL PRODUCT SUPPORT SERVICES
705
DOWNLOAD INFORMATION TO LOCAL INFO STORE
710
CHECK OFFSET VALUE AGAINST UPDATED INFO STORE
715
PASS UPDATED PROBLEM SOLUTION TO USER
720
ACCEPTABLE SOLUTION?
GO TO STEP 695
NO
YES
725
USER IMPLEMENTS PROBLEM SOLUTION
730
TERMINATE OPERATION OF TSP
END

FIG 6B

METHOD AND SYSTEM FOR TROUBLE SHOOTING AND CORRECTING COMPUTER SOFTWARE PROBLEMS

FIELD OF INVENTION

The present invention relates generally to use of computer software, and more particularly, the present invention relates to a method and system for trouble shooting and correcting computer software malfunctions and problems.

BACKGROUND OF THE INVENTION

In recent years, use of computers has expanded greatly to enhance and simplify many aspects of business and play. The expanding role of computers in every day life has hastened a like expansion in the use of a variety of computer software applications which perform numerous functions ranging from computer games to word processing to large scale data manipulation.

Unfortunately, computer software applications often malfunction for a number of reasons. Often a software application user fails to properly install a particular software application or component of a particular software application. Often the user's computer is not configured properly to allow proper operation of a particular software application, and inevitably, some software applications contain problems discovered by the providers of those software applications after they are placed on the market and installed by users. Consequently, such problems typically lead to time consuming, expensive, and annoying downtime of computers while users attempt to ascertain the reason for the problem and attempt to effect a correction.

To handle such problems, providers of software applications typically maintain a staff of product support services personnel to field inquiries from software applications users. However, calling product support services can be a daunting and intimidating task for software applications users. Explaining the exact nature of a software problem is often very difficult for the user. Moreover, such practice not only frustrates the user, but increases costs for the provider of the software applications.

Therefore, there is a need in the art for a cost-efficient and time-saving method and system for trouble shooting computer software problems that allow a user to identify and correct problems encountered during the use of a variety of software programs.

There is also a need in the art for a method and system for providing a user of software programs with a database of problem solutions which may be utilized to provide assistance without the need to contact the product support services personnel of the software providers.

There is further a need in the art for a method and system for obtaining on-line assistance from a remote problem solutions database which may be maintained and updated by the providers of software programs.

SUMMARY OF THE INVENTION

The present invention satisfies the above described needs by providing a method and system for trouble shooting and correcting computer software problems. When a user of a particular software program encounters a problem during use of that software program, the user launches a Trouble Shooting System onto his or her computer. For one aspect of the present invention, the Trouble Shooting System includes a Character Interface, a Trouble Shooting Program, and an Internet-based Trouble Shooting site and server.

The Character Interface allows the user to select from a menu of problems or the user may type into the Character Interface a natural language string to identify the problem. Generally described, the Trouble Shooting Program generates offset values corresponding to the problem identified by the user. The Trouble Shooting Program uses the offset values to locate problem solutions in an Information Store (database) of problem solutions. The problem solutions located in the Information Store are passed to the user for implementation of a correction of the problem.

If no solution is found in the Information Store, the Trouble Shooting Program may connect the user's computer to the remote Internet-based Trouble Shooting site and server to obtain and download additional problem solutions and tools to the Information Store on the user's computer. If a solution to the problem continues to evade the user, the Trouble Shooting Program then may recommend that the user contact the product support services of the user's malfunctioning software application.

More particularly described, one aspect of the present invention provides a method of trouble shooting a computer program problem. The method includes the steps of identifying the problem; generating a data location value corresponding to the problem; and locating a solution to the problem in a database of problem solutions using the data location value. The solution can then be implemented to correct the problem. Identifying the problem can be achieved by receiving, through a user interface, identification information about the problem from a user of the computer program.

Described in greater detail, another aspect of the present invention provides a method of identifying and correcting a computer program problem, including the steps of receiving, at a Character Interface, identification information about the problem, and causing the Character Interface to provide the identification information to a Trouble Shooting Program. The Trouble Shooting Program can generate an offset value corresponding to the identification information. The Trouble Shooting Program can use the offset value to locate a solution to the problem in an Information Store of problem solutions. In turn, a solution to the problem can be implemented by the Trouble Shooting Program.

Receiving identification information through the Character Interface may include receiving a problem identification from a selectable menu of possible problems. Alternatively the Character Interface may receive a natural language string describing the problem.

In another aspect, the Trouble Shooting Program can generate an offset value corresponding to the identification information by (1) sending the natural language string to a Trouble Shooting Engine and (2) causing the Trouble Shooting Engine to send the natural language string to a Natural Language Parser. The Natural Language Parser can parse the natural language string into a list of natural language words. In turn, this list of natural language words can be supplied to a Look-Up Table. This causes the Look-Up Table to generate an offset value for each of the list of natural language words.

The Trouble Shooting Program can implement a solution to the identified problem by providing the solution to a user of the computer program through the Character Interface. If the solution is acceptable to the user, operation of the Trouble Shooting Program is terminated. Alternatively, if the solution is not acceptable to the user, the Trouble Shooting Program can return to the Information Store to obtain a second solution to the problem.

If desired, prior to returning to the Information Store of problem solutions, additional problem solutions can be downloaded to the Information Store. The Trouble Shooting Program then can use the offset value to locate the second solution in the Information Store. Downloading additional problem solutions to the Information Store interfacing the Trouble Shooting Program with a remote server via the Internet and downloading the additional problem solutions from an Internet-based database resident on the remote server.

In another aspect of the present invention, a system for identifying and correcting a computer program problem is provided. The system includes a Character Interface operative to receive identification information about a computer program problem and a Trouble Shooting Program. The Trouble Shooting Program is operative to interface with the computer program and to transfer the identification information for the computer program problem to a Trouble Shooting Engine. In response to an offset value corresponding to the identification information, the Trouble Shooting Program can locate a solution to the problem in a database of problem solutions. This solution can then be implemented to correct the computer program problem.

The Character Interface can provide a user of the computer program a selectable menu of possible computer program problems. Alternatively, the Character Interface can receive from a user of the computer program a natural language string describing the computer program problem. In response, the Trouble Shooting Engine sends the natural language string to a Natural Language Parser. The Natural Language Parser can to parse the natural language string into a list of natural language words. The list of natural language words is output to a Look-Up Table. In response, the Look-Up Table generates an offset value for each of the list of natural language words.

In yet another aspect of the present invention, a method of trouble shooting a computer program problem is provided comprising the steps of launching a Trouble Shooting Program in response to a computer program problem, interfacing the Trouble Shooting Program with the computer program, causing the Trouble Shooting Program to query the computer program for information about the problem, and in response to that information, causing the Trouble Shooting Program to locate a solution to the problem in a database of problem solutions.

The step of causing the Trouble Shooting Program to implement the solution to correct the problem may include causing the Trouble Shooting Program to query the computer program for additional information about the problem. If desired, this step may include providing the solution to a user of the computer program via a character interface.

These and other features, advantages, and aspects of the present invention will be more clearly understood and appreciated from a review of the following detailed description of the disclosed embodiments and by reference to the appended drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a computer that provides a portion of the operating environment for an exemplary embodiment of the present invention.

FIG. **2** is a functional block diagram of the Internet representing a portion of the operating environment of an exemplary embodiment of the present invention.

FIG. **3** is a simplified block diagram illustrating the components of an exemplary embodiment of a Trouble Shooting System in accordance with the present invention.

FIG. **4** is a simplified block diagram illustrating the interaction of a Trouble Shooting Program with a software program in accordance with an exemplary embodiment of the present invention.

FIG. **5** is a simplified block diagram illustrating the interaction of a Trouble Shooting Engine with an Information Store in accordance with an exemplary embodiment of the present invention.

FIGS. **6**A and **6**B are flow diagrams illustrating the operation of an exemplary embodiment of the present invention.

DETAILED DESCRIPTION

This invention is directed to a method and system for trouble shooting and correcting problems encountered by users of various computer software applications. As will be understood, the present invention may be used for diagnosing error conditions of a variety of software program modules, such as application programs, operating system modules, Internet browsers, etc. For example, if a user of an application program, such as "WORD," version 8.0, produced by Microsoft Corporation of Redmond, Washington, encounters trouble printing a document, the user may launch the Trouble Shooting System of the present invention and run a diagnostic analysis of the problem encountered. The Trouble Shooting System will isolate the problem and effect a correction for the user. Alternatively, the Trouble Shooting System may instruct the user on how to correct the problem, or direct the user to call the provider of the application program (e.g., Microsoft Corporation) for help from product support services personnel.

The detailed description which follows is represented largely in terms of processes and symbolic representations of operations by conventional computer components, including a processor, memory storage devices for the processor, connected display devices, and input devices. Furthermore, these processes and operations may utilize conventional computer components in a heterogeneous distributed computing environment, including remote file servers, computer servers, and memory storage devices. Each of these conventional distributed computing components is accessible by the processor via a communication network.

The processes and operations performed by the computer include the manipulation of signals by a processor or remote server and the maintenance of these signals within data structures resident in one or more of the local or remote memory storage devices. Such data structures impose a physical organization upon the collection of data stored within a memory storage device and represent specific electrical or magnetic elements. These symbolic representations are the means used by those skilled in the art of computer programming and computer construction to most effectively convey teachings and discoveries to others skilled in the art.

For the purposes of this discussion, a process is generally conceived to be a sequence of computer-executed steps leading to a desired result. These steps generally require physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical, magnetic, or optical signals capable of being stored, transferred, combined, compared, or otherwise manipulated. It is conventional for those skilled in the art to refer to these signals as bits, bytes, words, values, elements, symbols, characters, terms, numbers, points, records, objects, images, files or the like. It should be kept in mind,

however, that these and similar terms should be associated with appropriate physical quantities for computer operations, and that these terms are merely conventional labels applied to physical quantities that exist within and during operation of the computer.

It should also be understood that manipulations within the computer are often referred to in terms such as adding, calling, comparing, receiving, sending, transferring, transmitting, etc. which are often associated with manual operations performed by a human operator. The operations described herein are machine operations performed in conjunction with various input provided by a human operator or user that interacts with the computer.

Referring now to the drawings, in which like numerals represent like elements throughout the several figures, aspects of the present invention and the preferred operating environment will be described.

Exemplary Operating Environment

FIG. **1** and the following discussion are intended to provide a brief, general description of a suitable computing environment in which the invention may be implemented. While the invention will be described in the general context of a program module, such as a software application, that runs on an operating system in conjunction with a personal computer, those skilled in the art will recognize that the invention also may be implemented in combination with other program modules.

Generally, program modules include routines, programs, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers, and the like. The invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

With reference to FIG. **1**, an exemplary system for implementing the invention includes a conventional personal computer **20**, including a processing unit **21**, a system memory **22**, and a system bus **23** that couples the system memory to the processing unit **21**. The system memory **22** includes read only memory (ROM) **24** and random access memory (RAM) **25**. A basic input/output system **26** (BIOS), containing the basic routines that help to transfer information between elements within the personal computer **20**, such as during start-up, is stored in ROM **24**. The personal computer **20** further includes a hard disk drive **27**, a magnetic disk drive **28**, e.g., to read from or write to a removable disk **29**, and an optical disk drive **30**, e.g., for reading a CD-ROM disk **31** or to read from or write to other optical media. The hard disk drive **27**, magnetic disk drive **28**, and optical disk drive **30** are connected to the system bus **23** by a hard disk drive interface **32**, a magnetic disk drive interface **33**, and an optical drive interface **34**, respectively. The drives and their associated computer-readable media provide nonvolatile storage for the personal computer **20**. Although the description of computer-readable media above refers to a hard disk, a removable magnetic disk and a CD-ROM disk, it should be appreciated by those skilled in the art that other types of media which are readable by a computer, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, and the like, may also be used in the exemplary operating environment.

A number of program modules may be stored in the drives and RAM **25**, including an operating system **35**, one or more program modules **36**, other program modules, such as the Trouble Shooting Program **110** of the present invention, and program data **38**. A user may enter commands and information into the personal computer **20** through a keyboard **40** and pointing device, such as a mouse **42**. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are often connected to the processing unit **21** through a serial port interface **46** that is coupled to the system bus, but may be connected by other interfaces, such as a game port or a universal serial bus (USB). A monitor **47** or other type of display device is also connected to the system bus **23** via an interface, such as a video adapter **48**. In addition to the monitor, personal computers typically include other peripheral output devices (not shown), such as speakers or printers.

The personal computer **20** may operate in a networked environment using logical connections to one or more remote computers. The remote computer may be a server, such as the Internet-based remote Trouble Shooting server **80***a*, a router, a peer device or other common network node, and typically includes many or all of the elements described relative to the personal computer **20**, although only a memory storage device **50** has been illustrated in FIG. **1**. The logical connections depicted in FIG. **1** include a local area network (LAN) **51** and a wide area network (WAN) **52**. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets and the Internet, which is illustrated in FIG. **2**.

When used in a LAN networking environment, the personal computer **20** is connected to the LAN **51** through a network interface **53**. When used in a WAN networking environment, the personal computer **20** typically includes a modem **54** or other means for establishing communications over the WAN **52**, such as the Internet **60**. The modem **54**, which may be internal or external, is connected to the system bus **23** via the serial port interface **46**. In a networked environment, program modules depicted relative to the personal computer **20**, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

As will be discussed in more detail below, an exemplary embodiment of the present invention provides for the initial downloading of components of the Trouble Shooting System **100** to the user's computer **20** from a remote server **80***a* via the Internet **60**. As will be discussed, subsequent database updates and Trouble Shooting System version updates are obtained from the remote server **80***a* via the Internet **60**.

FIG. **2** is a functional block diagram of the Internet **60**, a distributed electronic computing network that provides a portion of the operating environment for the preferred embodiment of the present invention. The Internet has in recent years become a mainstream commercial communication resource. E-mail and remote access to computer servers are currently widely used tools for reaching customers. The participants in the Internet are a wide variety of machines, organizations, and individuals, all able to communicate and share information. Physically, the Internet is an interconnected collection of thousands of computer

networks, tens of thousands of computers, and tens of millions of individual stations operated by end users. The user of the preferred embodiment of the present invention is preferably such an end-user. As is well known to those skilled in the art, to access an Internet site, an end user need only transmit the site's universal resource locator (URL) created in accordance with the standardized Domain Name System (DNS).

The Internet **60** includes a plurality of backbone networks **65***a* through **65***n*. These backbone networks form an international grid of high-speed, high-capacity data communication lines interconnecting a number of massive computers that serve as large-scale processing points or nodes. The backbone networks **65** are interconnected with each other through a plurality of network access points **70***a* through **70***n*. These network access points are interfaces through which information is communicated from one backbone network to another. The configuration and operation of the Internet backbone is well known to those skilled in the art and will not be further described herein.

The Internet **60** includes a plurality of Internet sites **75***a* through **75***n*. These Internet sites are generally operated by corporations, universities, and governmental organizations. Each Internet site may include one or more repositories of information and resources that may be accessed over the Internet. Each Internet site, as represented by the Internet site **75***a*, may include a plurality of web servers **80***a* through **80***n*. Each of these web servers may provide "home pages" to be visited, files to be read or downloaded, applications to be shared, and the like.

The Internet **60** also includes a plurality of points of presence **85***a* through **85***n* that are operated by local access providers. These local access providers are in the business of providing Internet access to end user stations. In the preferred embodiment of the present invention, the personal computer **20**, shown in FIG. **1**, is an end-user station. As shown in FIG. **2**, the point of presence **85***a* provides Internet access to the personal computer **20** (end user station) and other end user stations **88***a* through **88***n*, the point of presence **85***b* provides Internet access to end user stations **88***a*' through **88***n*', etc. All together, the points of presence **85** can provide Internet access to numerous end-user stations **88**. Each point of presence **85**, and each end user **88**, may, but need not, provide home pages for access by others on the Internet **60**.

As stated above, the personal computer **20**, illustrated in FIG. **1**, is also illustrated as an end user station connected to the Internet **60**, illustrated in FIG. **2**. As will be understood from the following discussion, the Trouble Shooting System **100** of the present invention provides for interaction between Internet-based components of the Trouble Shooting System **100** maintained on the Internet-based Trouble Shooting server **80***a* (FIG. **2**) with local components of the Trouble Shooting System **100** operated on the local computer **20** (FIGS. **1** and **2**).

Description of an Exemplary Embodiment

As briefly discussed above, this invention is directed to a method and system for trouble shooting and correcting problems encountered by users of various software applications. Referring now to FIGS. **1**, **2**, and **3**, the Trouble Shooting System (TSS) **100** of the present invention includes a Trouble Shooting Program (TSP) **110**, a Character Interface (CI) **150**, and an Internet-based Trouble Shooting site **75**A. In general when a user encounters some problem with a particular software program **120**, such as a print function error, the user may utilize the TSS **100** to assist in identifying and correcting the problem.

In order to utilize the TSS **100**, the user typically launches the TSP **110** onto the user's computer **20**. Using the CI **150**, the TSP **110** obtains information about the software problem from the user. As will be discussed below, the TSP **110** may also obtain information about the software program **120** directly from the software program via communication between the TSP **110** and the application program interfaces (API) of the software program. In the case where the TSP **110** obtains information from the user, the TSP **110**, through the CI **150**, may provide the user with a menu of typical problems to choose from. In an exemplary embodiment, the user may type a natural language string in response to a TSP **110** inquiry. In the latter situation, the TSP **110** sends the natural language string to a Trouble Shooting Engine (TSE) **160**, which is a component of the TSP **110**, as illustrated in FIG. **3**.

The TSE **160** parses the natural language string and generates a list of offset values corresponding to the problem encountered by the user. The offset values are then passed to an Information Store (IS) **200** where the offset values are used to locate solution information associated with the problem encountered by the user. The TSP **110** uses the problem solution information located in the IS **200** to effect corrections to the software **120**, as described above.

When the TSP **110** attempts to locate problem solution information in the IS **200**, as described above, the TSP **110** may determine the offset values provided by the TSE **160** do not correspond to a data location contained in the IS **200**. Alternatively, the problem solution information located in the IS **200** may not be effective in correcting the problem encountered by the user. If either such event arises, the TSP **110** may request permission from the user to connect the user to the Internet-based Trouble Shooting site **75***a*. The TSP **110** may update the IS **200** database with information contained in and downloaded from a corresponding Information Store database **300** resident on a Trouble Shooting Server **80***a* located at the Trouble Shooting site **75***a*.

Once the TSP **110** receives the required information, it may then effect the changes or instruct the user, as discussed above. If no acceptable solution is found via the Internet-based Information Store **300**, or if the user does not give permission to the TSP **110** to connect the user to the Internet site, or if the user does not have Internet capabilities, the TSP **110** will instruct the user to contact a service provider, such as the provider of the malfunctioning software application to discuss the problem with product support services personnel.

The user may install components of the Trouble Shooting System **100**, such as the TSP **110** and the CI **150**, onto the user's computer **20** using well known software installation media, such as a compact disks or floppy disks. Alternatively, the user may log onto the Internet **60**, as described above, and locate the Internet-based Trouble Shooting server **80***a* at the Trouble Shooting Internet site **75**A. As illustrated in FIG. **3**, the user may download the local CI **150** from an Internet-based Character Interface **280** and the local TSP **110** from an Internet-based Trouble Shooting Program **290** directly to the user's computer **20**. The user may download information from an Internet-based Information Store **300** to the local Information Store **190**. The amount of information downloaded to the local Information Store **190** can be determined by the user and may be limited by the memory capacity of the user's computer **20**.

As will be understood from the following description, the TSS **100** needs information about the configuration of the

user's computer **20** in order to function properly. The first time the user downloads the components of the TSS **100** to the user's computer **20**, the TSP **110** will store information about the configuration of the user's computer **20**. As is well known to those skilled in the art, the configuration information for the user's computer includes information on the operating system used by the user's computer **20**, information on the memory capacity of the user's computer **20**, and information on the existence of and configuration of communication paths to available software components. The configuration information stored locally by the TSP **110** can be updated incrementally as the configuration of the user's computer **20** changes.

There are numerous types of problems that can be handled by the TSS **100**. Three exemplary types of problems for which the TSS **100** may be used for identification and correction of software application problems include: (1) component existence and path testing; (2) corruption and version testing; and (3) OLE automation framework trouble shooting. It should be understood that these types of problems are exemplary only and do not limit application of this invention from use with other types of problems associated with the use of software applications.

Component existence and path testing includes testing to determine whether all the necessary components of a given software application are present on the computer **20** or whether those components are accessible via the correct communication paths. As is well known to those skilled in the art, most computer operating systems employ some type of registry to keep track of the available components of componentized software applications. For example, a user selects a spell checking function while using a particular word processing application. If an error is returned, the TSS **100** may be used to test for the existence of the spell checking component. If the spell checking component is not present on the user's computer **20**, the TSS **100** may be used to identify the problem and to instruct the user on how to install the missing component. Likewise, if a communication path from the user's word processing application to the spell checking component has become corrupted or is incorrectly configured, the TSS **100** can identify the problem and assist the user in effecting a correction.

Corruption and version testing includes testing the integrity of a particular application or file in terms of parity and/or file size. That is, the TSS **100** may be used to quickly identify file or application corruption, by effecting a parity check or file size check. For version testing, componentized software applications typically have several components that may be separately installed. For example, a version of a particular word processor may contain a component for translating Arabic to English. If the user attempts to translate Arabic into English and receives an error condition, the TSS **100** may be used to search for the existence of the proper version of the word processor. That is, the TSS **100** can be used to determine that the version of the word processor employed by the user is prior to the version which contains the component for translating Arabic to English.

OLE Automation framework trouble shooting includes identification and correction of problems with particular software applications where those applications are unable to perform required tasks, for example, printing to an alternate paper orientation.

Referring now to FIGS. **3** and **4**, in order for the TSS **100** to identify problems associated with a particular software application, the TSP **110** must interface with that software application. To interface with a particular software application **120** being used by the user, the TSP **110** utilizes the Trouble Shooting System Application Framework (AFX) **220**, as shown in FIGS. **3** and **4**. As will be understood by those skilled in the art, the AFX **220** is an implementation of an OLE component object. In an exemplary embodiment, the AFX **220** implements OLE component interface support. Methods of communication between two pieces of software using OLE framework are well known to those skilled in the art. FIG. **4** is a simplified block diagram illustrating an exemplary interaction of the TSP **110** with an exemplary software application **120** via the AFX **220**. The interface implemented by the software application **120** for communication with the TSP **110** is illustrated in FIG. **4** as the interface/Trouble Shooting System (i/TSS) **121**. As should be understood, all applications which will support the TSP **110**, or any of its components, must implement OLE component interfaces used by the TSP **110**.

Referring still to FIG. **4**, the TSP **110** will use the AFX **220** interface (OLE component interface) to get information from the software application **120**. For example, if the software application **120** represents a word processing application that is having printing problems, the TSP **110** will query the word processing application, through the AFX **220**, to give the TSP **110** a pointer to the software application's trouble shooting printer interface. The TSP **110** will use that interface to resolve the problem, as described below.

Implementation of an Exemplary Embodiment

As briefly discussed above, implementation of the TSS **100** is primarily effected on the user's computer **20** through the CI **150** and the TSP **110**. As will be understood by those skilled in the art, the CI **150** is a user interface which allows the user to communicate a problem or error encountered by the user to the TSP **110**. In an exemplary embodiment, the CI **150** is downloaded onto the user's computer **20** from the server **80***a* via the Internet, as described above, as a part of the TSS **100**. The CI **150** is preferably implemented as a dynamic-link library module (DLL) or as an Active X/OLE module. These types of modules are well known to those skilled in the art as modules that serve a specific function or set of functions and which may be launched only when needed by a program that calls them.

When the TSS **100** is launched on the user's computer **20**, the CI **150** may, in an exemplary embodiment, display an introductory character string such as "Welcome to the Trouble Shooting System." As discussed above, the CI **150** may provide the user with a menu of typical problems to choose from such as "paper out," or the user may type a natural language string such as "I am having printing problems." As is known to those skilled in the art, a natural language string or character string, is a set of characters such as numbers, letters, punctuation marks, or other symbols or control codes. For example, a natural language string may be represented by a computer as one unit of information such as one byte.

Information input by the user through the CI **150**, is passed to the Trouble Shooting Program (TSP) **110**. As shown in FIG. **3**, the TSP **110** includes a Trouble Shooting Engine (TSE) **160**, an Information Store (IS) **200**, an Application Framework (AFX) **220**, and an Internet Manager (IM) **250**. Information received by the CI **150** from the user is passed directly to the TSE **160**.

In an exemplary embodiment, the TSE **160** is tasked with translating the information input by the user through the CI **150** into a set of offset values. The TSP **110** uses the offset values to locate problem solution information in the IS **200**

for provision to the user. Referring to FIG. **5**, the TSE **160** includes a Natural Language Parser (NLP) **170**, a Look-Up Table **180** and an Information Store Communicator **190**. If the user inputs a natural language string to describe the problem, the natural language string is passed by the TSP **110** to the TSE **160**. The natural language string is then passed by the TSE **160** to the NLP **170**.

The NLP **170** parses the natural language string provided by the user into discrete words which will be used by the Look-Up Table **180** to generate offset values, as discussed above, corresponding to the parsed words. For example, if the user enters the natural language string "I am having printing problems," in an exemplary embodiment, the NLP **170** will delete the words "I", "am", "having", and "problems" as being too generic. The NLP **170** will then parse the word "printing" into various forms, such as "print," "printer," and "printed." In an exemplary embodiment, the list created by the NLP **170** may be prioritized from a basic root word such as "print" to more narrow forms such as "printing." As illustrated in FIG. **5**, the prioritized list of words parsed from the natural language string is then passed to the Look-Up Table **180** by the TSE **160**.

After receiving the prioritized list of words from the NLP **170**, the Look-Up Table **180** generates a list of offset values which correspond to the parsed words provided by the NLP **170**. As will be understood by those skilled in the art, these offset values serve as position pointers to direct the TSP **110** to specific database locations in the Information Store (IS) **200**, discussed below. In an exemplary embodiment, the Look-Up Table **180** generates offset values corresponding to the parsed words by a technique known as "hashing." As is well known to those skilled in the art, hashing is an indexing technique in which a value may be assigned to a character and may be numerically manipulated to calculate either the location of its associated record in a file or the starting point for a search for the associated record. If the character is part of a character string, such as a word, each character comprising the word may be assigned a numeric code to permit numerical manipulation.

Referring still to FIG. **5**, the list of offset values generated by the Look-Up Table **180** are passed to the IS **200** via the Information Store Communicator (ISC) **190** to locate specific database positions in the IS **200**. In an exemplary embodiment, the IS **200** is a database of problem solutions for provision to the user or for direct implementation by the TSP **110**, as discussed below. In an exemplary embodiment, the database is arranged as a table including rows **221** of information, as illustrated in FIG. **5**. In an exemplary embodiment, each data location contains particular problem solutions which may be offered by the TSP **110** to correct a problem encountered by the user.

The offset values generated by the Look-Up Table **180** may or may not translate directly into values that initially correspond to particular data locations in the IS **200**. For example, an offset value of **118** may mean the 118th column or the 118th row in the IS **200** database. To implement this offset value and to check whether the offset value is valid or not, the ISC **190** translates the offset value into values which correspond to particular locations in the IS **200** database. For example, if "print" is the string provided by the user and that string corresponds to the 118th row, the ISC **190** will translate the offset value of **118** to mean the 118th row of data.

In an exemplary embodiment, the information located in the IS **200** is dynamic in that the information stored is capable of being updated without the need to re-download other components of the TSS **100**, such as the CI **150** and the TSE **160**. Accordingly as the providers of software applications develop more trouble shooting information, or as updated versions of particular software applications are developed, the IS **200** may be updated. It should be understood that the information contained in the IS **200** may be incrementally updated and increased as new information becomes available without the need to download a new version of the entire IS **200** database.

The IS **200** may require update when new versions of software applications or components of componentized software applications are released by providers of those applications. Likewise, the IS **200** may require update as providers of software applications continue to discover and develop solutions for problems occurring with their respective software applications. Updates to the IS **200** may be effected by downloading the new information to the IS **200** by conventional data storage media such as compact disks and floppy disks. Alternatively, in an exemplary embodiment of the present invention, updated information may be downloaded to the IS **200** via the Internet-based Information Store **300**. As should be understood, updates may be downloaded to the Internet-based Information Store **300** by providers of software applications.

Referring still to FIG. **5**, the offset values provided by the Look-Up Table **180** are used to direct the TSP **110** to specific data locations in the IS **200** via the ISC **190**, as described above. For example, if the word "printer" is parsed from a natural language string provided by the user, as described above, the Look-Up Table **180** may generate an offset value of **118** for the word "printer." The TSE **160** then passes the offset value **118** to the IS **200** via the ISC **190**, as described above. The ISC **190** locates data position **118** in the IS **200** according to the offset value **118** and provides the information located at that location **118** to the user through the CI **150**.

In the present example, the information stored at data location **118** may include instructions to (1) check the size of the paper, and (2) check the orientation of the paper. In an exemplary embodiment, the data location corresponding to offset value **118** will also contain a number of different types of input the TSP **110** may receive back from the user.

For example, if the user is instructed to check the size of the paper, and the user responds that the paper is the correct size, the information contained in the IS **200** will have provided for that response from the user. That is, it should be understood that the data location in the IS **200** located according to the offset value provided by the Look-Up Table **180** will include values corresponding to user input. For example, if the printer offset is **118**, as described above, the data location corresponding to offset value **118** may include additional values (e.g. **119, 120, 121** . . . , etc.) which may correspond to input from the user, such as "yes," "no," or other.

The TSP **110** will then immediately pass the second instruction to the user, that is, check the orientation of the paper. It should be understood that the return offset value corresponding to the user's response may also direct the TSP **110** to step back into the IS **200** to retrieve more information. In an exemplary embodiment, the initial list of problem solutions provided to the user by the TSP **110** may be placed in a hierarchy from simple to complex.

Once the user responds affirmatively to one of the suggested problem solutions, the return offset value to the IS **200** for the affirmative response will direct the TSP **110** to a data location within the IS **200** which contains the possible

problem solution for the problem encountered and identified by the user. For example, if the user responds affirmatively that the paper orientation is incorrect, the affirmative response will return an offset value to the IS **200**. In response to that return offset value, the TSP **110** will retrieve from the IS **200** and pass to the user through the CI **150**, a possible problem solution, such as "Go to the format tool and select an alternative paper orientation."

Alternatively, and as briefly discussed above, the TSP **110** may automate part of the above described process by obtaining information directly from the software program **120** without input from the user. For example, instead of querying the user about the paper orientation where the user has identified a printing problem, the TSP **110**, according to an alternate embodiment of the present invention, may query the software program **120** directly about the paper orientation. As illustrated in FIG. **4** and, as discussed above, the TSP **110** gets information from the software program **120** via interfaces, such as OLE component interfaces which are well known in the art.

Following with the present example where the user has identified a printing problem, the TSP **110**, through the AFX **220**, may query the software program **120** for an interface to the software program's printing functions. The software program **120** will return to the TSP **110** a pointer to the software program's printer interface. The TSP **110**, using the pointer, will obtain various print functions from the software program's printer interface, including, for example, a function called "check paper orientation." The TSP **110** may then query that function to determine whether the paper orientation has been checked or changed. The response from the application will have an associated return value which has a corresponding offset value. The TSP **110** will use this offset value to locate additional problem solution information or queries in the IS **200** just as the TSP **110** does based on responsive user input, described in detail above. Accordingly, in the present example, the TSP **110** obviates the need to query the user as to whether the paper orientation has been checked. Therefore, instead of requiring user input, the TSP **110** can obtain some information directly from the software program **120**.

In some cases the problem solution located in the IS **200** will require tools or functionality beyond the capability of the TSP **110**. In such cases, the TSP **110** will direct the user to the Additional Tools **320** located on the Internet-based Trouble Shooting server **80***a*, as shown in FIG. **3**. For example, the TSP **110** determines that the user's network is not setup properly to allow the user to access a remote printer. Consequently, the TSP **110** may ask the user to use a printer setup tool to accomplish the setup. If the user's machine does not have the tool for whatever reason, the user can ask the TSS **100** to pull the tool from the Internetbased Trouble Shooting server **80***a*. All the necessary tools for performing the corrective action will have to be downloaded from the server **80***a* to the user's computer **20**, as discussed below.

As briefly discussed above, the CI **150** may provide the user with a menu of possible problems to select from. In the case of a menu of choices, the choices provided by the CI **150** are assigned specific offset values which correspond to data locations in the IS **200**. That is, if the user selects a problem from the menu of choices provided by the CI **150**, the TSE **160** is not required to parse a character string and provide offset values for a data location in the IS **200**, as described above. The offset values corresponding to the menu of choices may be used by the TSP **110** to go directly to the IS **200** for location of problem solutions to be passed to the user.

In some cases, the TSP **10** may effect a solution to a problem for the user by direct implementation of problem solutions located in the IS **200**. As discussed above, the TSP **110** stores information about the configuration of the user's computer **20** when the components of the TSS **100** are initially installed on the user's computer **20**. If, for example, the user has a problem associated with a communication path between the components of a componentized software application, the TSP **110** may effect changes to overcome the problem without the assistance of the user, once the problem has been identified, as described in detail above. In an exemplary embodiment of the present invention, the user will have the option of manually effecting such corrections or allowing the TSP **110** to automatically effect the corrections upon identification thereof. IF the TSP **110** automatically effects any corrections, the user will be informed through the CI **150** of the corrections performed.

Additionally, in an exemplary embodiment, the user may request the TSP **110** to monitor commands given to the software application **120** by the user in the user's attempt to implement the software application **120**. This monitoring preferably will be done through an OLE component interface as is well known to those skilled in the art. Once the user has requested monitoring, the TSS **100** will interface with the software application **120**, as described above. As described above, the AFX **220** will be implemented for communicating application events to the TSS **100**. Accordingly, the TSP **110** will gain information as to whether the user is erroneously operating the software application **120** or whether a problem exists with the software application **120**. As with the menu of choices provided by the CI **150**, if the TSP **110** determines the existence of a problem without the need of information from the user, the TSP **110** can pass a list of offset values corresponding to that known problem directly to the IS **200** for provision of solution parameters.

When TSP **110** is in a monitoring mode, it will launch the CI **150** and start the trouble shooting session. For example, a user using a word processing program receives an error that the CapsLock is activated. This error message will give the user an option of launching the TSP **100** to fix the problem. Because the TSP **110** has been launched for a specific error condition, it may, in an exemplary embodiment, attempt to isolate and correct the error without additional user input.

As discussed, the Internet-based Trouble Shooting site **75**A may be used for on-line update of information contained in the IS **200** on the user's computer **20**. If no affirmative response is returned by the user to any problem solution offered by the TSP **110**, or if the offset value generated by the Look-Up Table **180** is outside the range of data locations contained in the IS **200**, the TSP **110** will return an offset value to the IS **200** which will correspond to a request to the user to connect to the Internet-based Trouble Shooting site **75**A. If the user answers the request affirmatively, the TSP **110** will connect the user's computer **20** to the Internet-based Trouble Shooting site **75***a* and ultimately to the Internet-based Trouble Shooting server **80***a*.

As illustrated in FIG. **3**, the TSP **110** will communicate with the Internet-based Trouble Shooting site **75***a* via the Internet Manager **250**. As should be understood the Internet Manager **250** is a software application component that facilitates connection of the user's computer **20** and the TSP **110** with the Internet-based Trouble Shooting site **75***a*. In an exemplary embodiment, the Internet Manager **250** serves to translate information between the Internet-based compo-

nents of the TSS **100** and the local components of the TSS **100** when format differences exist between the Internetbased and the local components of the TSS **100**.

As illustrated in FIG. **3**, the TSP **110** will then download additional information from the Internet-based Information Store **300** to the IS **200**. Accordingly, the TSP **110** will then provide additional problem solutions downloaded from the Internet-based Information Store **300** to the user. If the TSP **110** is still unable to provide an acceptable problem solution to the user, the TSP **110** will default to an offset value that corresponds to a recommendation that the user contact the provider of the malfunctioning software application **120** for assistance from the provider's product support services (PSS) personnel. It should be understood that if the user does not have the capability for connection with the Internet-based Trouble Shooting site **75**A, the TSP **110** likewise will recommend that the user contact PSS personnel of the software application provider.

In an exemplary embodiment, The TSP **110** will store and maintain a log of all corrective steps taken to correct the user's problem. Particularly, each time an offset value is generated, the TSP **110** stores the offset value into a file. This file may be sent to the software application provider's PSS personnel by mail, electronic mail, or the user may call the PSS personnel and read the offset values to the PSS personnel. The PSS personnel will have access to the database included in the Internet-based Information Store **300** which normally would be available on the Internet Site **75***a*, but which is unavailable to the user.

Operation of an Exemplary Embodiment

The method and system of an exemplary embodiment of the present invention is best illustrated by showing, as an example, how the method and system process a printing error encountered by a user of a word processing software application. Referring now to the drawings, FIGS. **6**A and **6**B are flow diagrams illustrating the operation of an exemplary embodiment of the present invention. Numbered components refer to FIGS. **1–5**.

Referring now to FIG. **6**A, at Step **600**, a user launches a word processing software application onto the user's computer **20** for use in drafting a letter. At Step **605**, the user attempts to print the letter using a printer (not shown) attached to the computer **20**. At Step **610**, the user receives an error message that the letter did not print to the attached printer. At Step **615**, the user launches the TSP **110**. Alternatively, if the TSS **100** is in a monitoring mode, as described above, then the TSS **100** may have already discovered the error condition and automatically launched the TSP **110**.

In response, at Step **620**, the CI **150** is launched by the TSP **110** and displays the statement "Welcome to the Troubleshooting System" onto the monitor of the user's computer **20**. At Step **625**, the CI **150** presents a menu of possible problems encountered by the user. If the menu of choices provided by the CI **150**, at Step **625**, contains the printer problem encountered by the user, the user may, if desired, select the choice corresponding to the problem the user has encountered. At decision Step **630**, the user must decide whether to select from the menu of choices provided by the CI **150** or to type a natural language string. If the user selects from the menu of choices provided by the CI **150**, the method follows the "YES" branch to Step **665**, and the TSP **110** uses offset values pre-assigned to the choices contained in the menu to locate problem solutions in the Information Store **200**.

In the present example, the user is unable to find a choice from the menu of choices which corresponds to the problem the user has encountered. Accordingly, the method follows the "NO" branch and proceeds to Step **635** where the user types in a natural language character string, such as "I am having printing problems." At Step **640**, the TSP **110** passes the natural language string entered by the user to the TSE **160**. At Step **645**, and as illustrated in FIG. **5**, the TSE **160** passes the natural language string to the NLP **170**. At Step **650**, the NLP **170** parses the natural language string entered by the user to create a list including the word "print."The list including the word "print" is passed from the NLP **170** to the Look-Up Table **180** at Step **655**.

At Step **660**, the Look-Up Table **180** generates an offset value **118** corresponding to the parsed word "print."As discussed above, the data location in the IS **200** corresponding to offset value **118** will also include return values corresponding to anticipated responses from the user. At Step **665**, the TSP **110** uses the offset value **118** to locate a data position in the IS **200** via the ISC **190**. Referring now to FIG. **6**B, at Step **670**, the TSP **110** checks the IS **200** database for a database entry matching the offset value **118**. If no data location is found in the IS **200** corresponding to the offset value **118**, the method follows the "NO" branch to Step **690**, where the TSP **110** will recommend the user connect to the Internet-based Trouble Shooting site **75**A to download additional problem solution information to the local Information Store **200**.

In the present example, a database location is found in the IS **200** corresponding to the offset value **118**, as illustrated in FIG. **5**. Accordingly, the method follows the "YES" branch to Step **675**. At Step **675**, the TSP **110** passes the information located at the data location corresponding to the offset value **118** to the user. In the present example the information located at data location **118** in the IS **200**, recommends the user check whether the printer has paper. At Step **680**, the TSP **110**, using the information provided from the IS **200** queries the user via the CI **150** as to whether the printer has paper.

If the user responds that the printer does not have paper, the user's response will correspond to an offset value provided with the set of values located in the IS **200** using the offset value provided by the Look-Up Table **180** for the user's problem. The return offset value corresponding to the user's response will be used by the TSP **110** to go to another location in the IS **200** to obtain an instruction to provide to the user to add paper to the printer. The method accordingly will follow the "YES" branch to Step **725**, where the user will implement the problem solution and exit the Trouble Shooting Program **110**.

However, in the present example, the user responds indicating that the printer does have paper which renders the problem solution offered by the TSP **110** unacceptable to correct the problem encountered by the user. At Step **685**, a return value corresponding to the user's response causes the TSP **110** to return to the IS **200** for more information. At decision Step **687**, the TSP **110** checks the data location **118** in the IS **200** for additional problem solutions. If additional problem solutions are available, the method follows the "YES" branch back to Step **675** and passes the additional problem solutions to the user.

In the present example, the TSP **110** finds no additional problem solutions in the IS **200**. Accordingly, at Step **690**, the TSP **110** returns a recommendation to the user that the user allow the TSP **110** to connect the user's computer **20** to the Internet-based Trouble Shooting site **75**A to receive an

update of the information contained in the IS **200** from the Internet-based Information Store **300** resident on the Trouble Shooting server **80**A. If the user declines to be connected to the Internet-based Trouble Shooting site **75**A, or if the user's computer **20** does not have Internet capabilities, the method follows the "NO" branch to step **695**, where the TSP **110** recommends that the user contact the product support services of the provider of the user's word processing application.

In the present example, the user authorizes the TSP **110** to connect the user's computer **20** to the Internet-based Trouble Shooting site **75**A. Accordingly, at Step **700**, the TSP **110**, through the IM **250**, connects the user's computer **20** to the Internet-based Trouble Shooting site **75**A. At Step **705**, the TSP **110** downloads data contained in the Internet-based Information Store **300** resident at the Trouble Shooting server **80**A to the local Information Store **200** on the user's computer **20**.

Alternatively, the user may choose to query the Internet-based Information Store **300** on-line rather than downloading new data to the user's machine At Step **710**, the original offset value **118** is checked against the updated data now contained in the IS **200**, or alternatively, the offset value is checked on-line against the data contained in the Internet-based Information Store **300**. Accordingly, at Step **715**, an additional problem solution is passed to the user from the IS **200**, in this case, or from the Internet-based IS **300**, if desired to check the printer power source.

At Step **720**, the user determines whether the problem solution is acceptable for correcting the problem. If the solution is not acceptable, the method follows the "NO" branch to step **695**, as discussed above. If the problem solution is acceptable, the method follows the "YES" branch to step **725**. At Step **725**, the user checks the printer power source to find that the power cable to the attached printer has become disconnected, and accordingly, the user implements the problem solution. The user responds to the query in the affirmative that the power source was in fact the problem. In response to the affirmative response from the user, at Step **730**, the operation of the method is terminated by the TSP **110**.

Advantageously, the present invention provides a Trouble Shooting System for identifying and correcting problems encountered with computer software programs. The present invention provides for a user interactive Trouble Shooting Program, maintained on a user's computer, which maintains a database of problem solutions for use in identifying and correcting computer program problems. If required or desired, the Trouble Shooting Program may download additional problem solution information and tools from Internet-based components of the Trouble Shooting System.

While this invention has been described in detail with particular reference to exemplary embodiments thereof, it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described herein and as defined in the appended claims.

What is claimed is:

1. A method of identifying and correcting a computer program problem, comprising the steps of:

receiving, at a Character Interface, identification information about said problem, said identification information including a natural language string describing said problem;

causing said Character Interface to provide said identification information to a Trouble Shooting Program;

causing said Trouble Shooting Program to send said natural language string to a Trouble Shooting Engine;

causing said Trouble Shooting Engine to send said natural language string to a Natural Language Parser;

causing said Natural Language Parser to parse said natural language string into a list of natural language words;

sending said list of natural language words to a Look-Up Table;

causing said Look-Up Table to generate offset values corresponding to each word of said list of natural language words;

causing said Trouble Shooting Program to use said offset values to locate a solution to said problem in an Information Store of problem solutions; and

causing said Trouble Shooting Program to implement said solution to said problem.

2. The method recited in claim **1**, wherein said Information Store of problem solutions is resident on a local computing device.

3. The method recited in claim **1**, wherein said Information Store of problem solutions is resident on a remote server.

4. The method recited in claim **1**, wherein said step of receiving, at a Character Interface, identification information about said problem, further comprises the step of receiving said natural language string from a menu of possible problems.

5. The method recited in claim **1**, wherein said step of causing said Trouble Shooting Program to implement said solution to said problem, further comprises the steps of:

causing said Trouble Shooting Program to provide said solution through said Character Interface;

if said solution is acceptable, terminating operation of said Trouble Shooting Program; and

if said solution is not acceptable, causing said Trouble Shooting Program to return to said Information Store of problem solutions to obtain a second solution to said problem.

6. The method recited in claim **5**, further comprising the steps of:

prior to returning to said Information Store to obtain a second solution to said problem,

downloading additional problem solutions to said Information Store;

after downloading said additional problem solutions, causing said Trouble Shooting Program to use said offset values to locate said second solution in said Information Store;

causing said Trouble Shooting Program to implement said second solution.

7. The method recited in claim **6**, wherein said step of downloading additional problem solutions to said Information Store comprises the steps of:

interfacing said Trouble Shooting Program with a remote server via a distributed electronic network; and

downloading said additional problem solutions from an Internet-based database of problem solutions resident on said remote server.

8. The method recited in claim **6**, wherein said step of downloading additional problem solutions to said Information Store comprises:

downloading said additional problem solutions from a computer-readable data storage medium.

9. A system for identifying and correcting a computer program problem, comprising:

a Character Interface operative to receive identification information about a computer program problem, said

identification information including a natural language string describing said computer program problem;

a Trouble Shooting Program operative

to interface with said computer program,

to send said natural language string to a Natural Language Parser;

said Natural Language Parser being operative

to parse said natural language string into a list of natural language words, and

to send said list of natural language words to a Look-Up Table;

said Look-Up Table being operative

to generate offset values corresponding to each word of said list of natural language words; and

said Trouble Shooting Program being further operative

to use said offset values to locate a solution to said problem in a database of problem solutions, and

to implement said solution to correct said computer program problem.

10. The system of claim **9**, wherein said Character Interface is further operative to provide a selectable menu of possible computer program problems.

11. The system of claim **9**, wherein said Trouble Shooting Program is further operative

to interface with a remote server via the Internet; and

to download additional problem solution resources to said database of problem solutions.

12. A computer-readable medium on which is stored a Trouble Shooting Program for identifying and correcting a computer program problem, said Trouble Shooting Program comprising instructions which, when executed by a computer, perform the steps of:

receiving identification information about said problem via a Character Interface;

causing said Character Interface to provide said identification information to a Trouble Shooting Engine;

causing said Trouble Shooting Engine to generate offset values corresponding to said identification information;

if said identification information is received in the form of a natural language string, parsing said natural language string into a list of natural language words;

passing said list of natural language words to a Look-Up Table; and

causing said Look-Up Table to generate offset values corresponding to each word of said list of natural language words;

using said offset values generated by said Trouble Shooting Engine to locate a solution to said problem in a database of problem solutions; and

implementing said solution to said problem.

13. The computer-readable medium of claim **12**, wherein said step of implementing said solution to said problem, further comprises the step of:

if said solution does not correct said problem, downloading additional problem solutions to said database of problem solutions from a remote server via the Internet.

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